

## CLAIMS

1. A compound comprising a conjugate of;
  - (i) a polynucleotide or oligonucleotide molecule;
  - (ii) a carrier comprising at least one aldehyde group; and, optionally,
  - 5 (iii) a suitable linker molecule conjugating said polynucleotide or oligonucleotide with said carrier.
2. The compound of claim 1, wherein the polynucleotide or oligonucleotide molecule is an oligonucleotide molecule in the range of 5 to 50 bases in length.
3. The compound of claim 1, wherein the polynucleotide or oligonucleotide molecule 10 is a polynucleotide molecule in the range of 50 bases to 10 kilobases in length.
4. The compound of claim 3, wherein the polynucleotide molecule is in the range of 1 to 6 kilobases in length.
5. The compound of any one of claims 1 to 4, wherein the said polynucleotide or 15 oligonucleotide molecule comprises an expression cassette comprising a suitable promoter sequence operably linked to a nucleotide sequence encoding a protein(s) or peptide(s).
6. The compound of claim 5, wherein said protein(s) or peptide(s) is an antigen or comprises one or more epitopes.
7. The compound of claim 5, wherein said protein(s) or peptide(s) is a polytope 20 peptide.
8. The compound of claim 5, wherein said protein(s) or peptide(s) is an enzyme, receptor or hormone.
9. The compound of any one of claims 1 to 4, wherein the polynucleotide or 25 oligonucleotide molecule is an antisense RNA, catalytic RNA or small interfering RNA (siRNA).
10. The compound of any one of claims 1 to 9, wherein the carrier comprises a plurality of aldehyde groups ranging in number from 20 to 750.
11. The compound of claim 11, wherein the carrier comprises a plurality of aldehyde groups ranging in number from 100 to 500.
- 30 12. The compound of claim 12, wherein the carrier comprises a plurality of aldehyde groups ranging in number from 200 to 400.

13. The compound of any one of claims 1 to 12, wherein the carrier is any ligand which is recognised by a cell-surface receptor and, following binding to the receptor, can be endocytosed.
14. The compound of claim 13, wherein the carrier is a ligand selected from the group consisting of hormones, enzymes, cytokines and carbohydrate polymers.
- 5 15. The compound of claim 14, wherein the carrier is a carbohydrate polymer.
16. The compound of claim 15, wherein the carrier is an oxidised carbohydrate polymer.
17. The compound of claim 16, wherein the carrier is oxidised mannan.
- 10 18. The compound of any one of claims 1 to 17, wherein the compound comprises a suitable linker molecule conjugating the polynucleotide or oligonucleotide molecule to the carrier.
19. The compound of claim 18, wherein the linker molecule is a polycation linker.
20. The compound of claim 19, wherein the linker molecule is selected from the group consisting of poly-L-lysine (PLL), polyethylimine (PEI), dendrimers and cationic lipids.
- 15 21. A method for cell-specific delivery of a polynucleotide or oligonucleotide molecule to a target cell(s) of a subject, said method comprising:  
administering the compound of any one of claims 1 to 20 to said subject.
- 20 22. A method for inducing an immune response to an antigen or epitope(s), wherein said immune response is primarily a CD8<sup>+</sup> type of immune response, said method comprising:  
providing a compound comprising a conjugate of;  
(i) a polynucleotide or oligonucleotide molecule comprising a nucleotide sequence encoding an antigen or epitope(s);  
(ii) a carrier comprising at least one aldehyde group; and, optionally,  
(iii) a suitable linker molecule conjugating said polynucleotide or oligonucleotide with said carrier; and  
administering said compound to said subject in an amount to induce a primarily CD8<sup>+</sup> type of immune response to said antigen or epitope(s).
- 25 30 23. The method of claim 22, wherein the carrier comprises a plurality of aldehyde groups ranging in number from 20 to 750.

24. The method of claim 23, wherein the carrier comprises a plurality of aldehyde groups ranging in number from 100 to 500.
25. The method of claim 24, wherein the carrier comprises a plurality of aldehyde groups ranging in number from 200 to 400.
- 5 26. The method of any one of claims 21 to 25, wherein the carrier is any ligand which is recognised by a cell-surface receptor and, following binding to the receptor, can be endocytosed.
27. The method of claim 26, wherein the carrier is a ligand selected from the group consisting of hormones, enzymes, cytokines and carbohydrate polymers.
- 10 28. The method of claim 27, wherein the carrier is a carbohydrate polymer.
29. The method of claim 28, wherein the carrier is an oxidised carbohydrate polymer.
30. The method of claim 29, wherein the carrier is oxidised mannan.
31. A method for inducing an immune response to an antigen or epitope(s), wherein said immune response is primarily a CD4<sup>+</sup> type of immune response, said method comprising:
  - 15 providing a compound comprising a conjugate of;
    - (i) a polynucleotide or oligonucleotide molecule comprising a nucleotide sequence encoding an antigen or epitope(s);
    - (ii) a carrier comprising reduced mannan; and, optionally,
    - (iii) a suitable linker molecule conjugating said polynucleotide or oligonucleotide with said carrier; and
  - 20 administering said compound to said subject in an amount to induce a primarily CD4<sup>+</sup> type of immune response.
32. The method of any one of claims 21 to 31, wherein the polynucleotide or 25 oligonucleotide molecule is an oligonucleotide molecule in the range of 5 to 50 bases in length.
33. The method of any one of claims 21 to 31, wherein the polynucleotide or oligonucleotide molecule is a polynucleotide molecule in the range of 50 bases to 10 kilobases in length.
- 30 34. The method of claim 33, wherein the polynucleotide molecule is in the range of 1 to 6 kilobases in length.

35. The method of any one of claims 21 to 34, wherein the said polynucleotide or oligonucleotide molecule comprises an expression cassette comprising a suitable promoter sequence operably linked to a nucleotide sequence encoding a protein(s) or peptide(s).
- 5 36. The method of claim 35, wherein said protein(s) or peptide(s) is an antigen or comprises one or more epitopes.
37. The method of claim 35, wherein said protein(s) or peptide(s) is a polytope peptide.
- 10 38. A compound comprising a conjugate of;
  - (i) a polynucleotide or oligonucleotide molecule;
  - (ii) a carrier comprising reduced mannan; and, optionally,
  - (iii) a suitable linker molecule conjugating said polynucleotide or oligonucleotide with said carrier.
- 15 39. The compound of claim 38, wherein the polynucleotide or oligonucleotide molecule is an oligonucleotide molecule in the range of 5 to 50 bases in length.
40. The compound of claim 38, wherein the polynucleotide or oligonucleotide molecule is a polynucleotide molecule in the range of 50 bases to 10 kilobases in length.
- 20 41. The compound of claim 40, wherein the polynucleotide molecule is in the range of 1 to 6 kilobases in length.
42. The compound of any one of claims 38 to 41, wherein the said polynucleotide or oligonucleotide molecule comprises an expression cassette comprising a suitable promoter sequence operably linked to a nucleotide sequence encoding a protein(s) or peptide(s).
- 25 43. The compound of claim 42, wherein said protein(s) or peptide(s) is an antigen or comprises one or more epitopes.
44. The compound of claim 42, wherein said protein(s) or peptide(s) is a polytope peptide.
- 30 45. The compound of claim 42, wherein said protein(s) or peptide(s) is an enzyme, receptor or hormone.

46. The compound of any one of claims 38 to 41, wherein the polynucleotide or oligonucleotide molecule is an antisense RNA, catalytic RNA or small interfering RNA (siRNA).
47. The compound of any one of claims 38 to 46, wherein the compound comprises a suitable linker molecule conjugating the polynucleotide or oligonucleotide molecule to the carrier.  
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48. The compound of claim 47, wherein the linker molecule is a polycation linker.
49. The compound of claim 48, wherein the linker molecule is selected from the group consisting of poly-L-lysine (PLL), polyethylenimine (PEI), dendrimers and cationic  
10 lipids.